

CLAIMS

1. An electrode material for electrical discharge machining made of a W-Cu alloy containing at least 40% by weight of W (1), at most 15% by weight of one of an additional element and a compound thereof (3), and a balance of Cu (2), containing, as one of said additional element and said compound thereof (3), at most 10% by weight of at least one selected from an alkali metal element, an alkaline-earth metal element and a rare-earth element, and an oxide, a hydroxide, a nitride, a boride and a sulfide of said elements in particles having a mean particle diameter of less than $3\mu\text{m}$.

2. The electrode material for electrical discharge machining according to claim 1, wherein said at least one selected from said alkali metal element, said alkaline-earth metal element and said rare-earth element, and said oxide, said hydroxide, said nitride, said boride and said sulfide of said elements in particles has a mean particle diameter of less than $1\mu\text{m}$.

3. The electrode material for electrical discharge machining according to claim 1, wherein said at least one selected from said alkali metal element, said alkaline-earth metal element and said rare-earth element, and said oxide, said hydroxide, said nitride, said boride and said sulfide of said elements in particles has a mean interparticle spacing of at most $10\mu\text{m}$.

4. The electrode material for electrical discharge machining according to claim 1, wherein said at least one selected from said alkali metal element, said alkaline-earth metal element and said rare-earth element, and said oxide, said hydroxide, said nitride, said boride and said sulfide of said elements in particles exists in the Cu (2).

5. The electrode material for electrical discharge machining according to claim

1, wherein said at least one selected from said alkali metal element, said alkaline-earth metal element and said rare-earth element, and said oxide, said hydroxide, said nitride, said boride and said sulfide of said elements in particles exists in some of W (1) particles.

5 6. The electrode material for electrical discharge machining according to claim 1, wherein said alkali metal element, said alkaline-earth metal element and said rare-earth element, and said oxide, said hydroxide, said nitride, said boride and said sulfide of said elements are at least one of Ba, Nd, Ce, Y, Ca and K, and an oxide and a hydroxide thereof.

10 7. The electrode material for electrical discharge machining according to claim 1, wherein said W (1) contains at least 30% by weight of particles having a particle diameter of at most 1 μ m with respect to all of W (1) particles.

15 8. The electrode material for electrical discharge machining according to claim 1, wherein at most 10% by weight of Ni is further contained instead of a portion of said Cu (2).

20 9. A method of manufacturing the electrode material for electrical discharge machining recited in claim 1, using a source powder containing a Cu powder and/or a W powder, and a powder of at least one selected from an alkali metal element, an alkaline-earth metal element and a rare-earth element, and an oxide, a hydroxide, a nitride, a boride and a sulfide of said elements, said source powder being mixed by using one of a mechanical alloying method, a method of using a fine source powder, and a
25 coprecipitation method.

 10. An electrode material for electrical discharge machining made of a W-Cu alloy containing at least 40% by weight of W (1), at most 15% by weight of one of an

additional element and a compound thereof (3), and a balance of Cu (2), containing, as one of said additional element and said compound thereof (3), at most 10% by weight of at least one selected from an alkali metal element, an alkaline-earth metal element and a rare-earth element, and an oxide, a hydroxide, a nitride, a boride and a sulfide of said elements in particles having a mean interparticle spacing of at most 20 μ m.

11. The electrode material for electrical discharge machining according to claim 10, wherein said at least one selected from said alkali metal element, said alkaline-earth metal element and said rare-earth element, and said oxide, said hydroxide, said nitride, said boride and said sulfide of said elements in particles has a mean particle diameter of less than 1 μ m.

12. The electrode material for electrical discharge machining according to claim 10, wherein said at least one selected from said alkali metal element, said alkaline-earth metal element and said rare-earth element, and said oxide, said hydroxide, said nitride, said boride and said sulfide of said elements in particles has a mean interparticle spacing of at most 10 μ m.

13. The electrode material for electrical discharge machining according to claim 10, wherein said at least one selected from said alkali metal element, said alkaline-earth metal element and said rare-earth element, and said oxide, said hydroxide, said nitride, said boride and said sulfide of said elements in particles exists in the Cu (2).

14. The electrode material for electrical discharge machining according to claim 10, wherein said at least one selected from said alkali metal element, said alkaline-earth metal element and said rare-earth element, and said oxide, said hydroxide, said nitride, said boride and said sulfide of said elements in particles exists in some of W (1) particles.

15. The electrode material for electrical discharge machining according to claim 10, wherein said alkali metal element, said alkaline-earth metal element and said rare-earth element, and said oxide, said hydroxide, said nitride, said boride and said sulfide of said elements are at least one of Ba, Nd, Ce, Y, Ca and K, and an oxide and a hydroxide thereof.

16. The electrode material for electrical discharge machining according to claim 10, wherein said W (1) contains at least 30% by weight of particles having a particle diameter of at most 1 μ m with respect to all of W (1) particles.

17. The electrode material for electrical discharge machining according to claim 10, wherein at most 10% by weight of Ni is further contained instead of a portion of said Cu (2).

18. A method of manufacturing the electrode material for electrical discharge machining recited in claim 10, using a source powder containing a Cu powder and/or a W powder, and a powder of at least one selected from an alkali metal element, an alkaline-earth metal element and a rare-earth element, and an oxide, a hydroxide, a nitride, a boride and a sulfide of said elements, said source powder being mixed by using one of a mechanical alloying method, a method of using a fine source powder, and a coprecipitation method.

19. An electrode material for electrical discharge machining made of a W-Cu alloy containing at least 40% by weight of W (1), at most 15% by weight of one of an additional element and a compound thereof (3), and a balance of Cu (2), containing, as one of said additional element and said compound thereof (3), at most 10% by weight of at least one selected from an alkali metal element, an alkaline-earth metal element and a

rare-earth element, and an oxide, a hydroxide, a nitride, a boride and a sulfide of said elements in particles having a mean particle diameter of less than $3\mu\text{m}$ and a mean interparticle spacing of at most $20\mu\text{m}$.

5 20. The electrode material for electrical discharge machining according to claim 19, wherein said at least one selected from said alkali metal element, said alkaline-earth metal element and said rare-earth element, and said oxide, said hydroxide, said nitride, said boride and said sulfide of said elements in particles has a mean particle diameter of less than $1\mu\text{m}$.

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 21. The electrode material for electrical discharge machining according to claim 19, wherein said at least one selected from said alkali metal element, said alkaline-earth metal element and said rare-earth element, and said oxide, said hydroxide, said nitride, said boride and said sulfide of said elements in particles has a mean interparticle
15 spacing of at most $10\mu\text{m}$.

 22. The electrode material for electrical discharge machining according to claim 19, wherein said at least one selected from said alkali metal element, said alkaline-earth metal element and said rare-earth element, and said oxide, said hydroxide, said
20 nitride, said boride and said sulfide of said elements in particles exists in the Cu (2).

 23. The electrode material for electrical discharge machining according to claim 19, wherein said at least one selected from said alkali metal element, said alkaline-earth metal element and said rare-earth element, and said oxide, said hydroxide, said
25 nitride, said boride and said sulfide of said elements in particles exists in some of W (1) particles.

 24. The electrode material for electrical discharge machining according to

claim 19, wherein said alkali metal element, said alkaline-earth metal element and said rare-earth element, and said oxide, said hydroxide, said nitride, said boride and said sulfide of said elements are at least one of Ba, Nd, Ce, Y, Ca and K, and an oxide and a hydroxide thereof.

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25. The electrode material for electrical discharge machining according to claim 19, wherein said W (1) contains at least 30% by weight of particles having a particle diameter of at most 1 μ m with respect to all of W (1) particles.

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26. The electrode material for electrical discharge machining according to claim 19, wherein at most 10% by weight of Ni is further contained instead of a portion of said Cu (2).

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27. A method of manufacturing the electrode material for electrical discharge machining recited in claim 19, using a source powder containing a Cu powder and/or a W powder, and a powder of at least one selected from an alkali metal element, an alkaline-earth metal element and a rare-earth element, and an oxide, a hydroxide, a nitride, a boride and a sulfide of said elements, said source powder being mixed by using one of a mechanical alloying method, a method of using a fine source powder, and a coprecipitation method.

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28. An electrode material for electrical discharge machining made of a W-Cu alloy containing at least 40% by weight of W (1), at most 15% by weight of one of an additional element and a compound thereof (3), and a balance of Cu (2), containing, as one of said additional element and said compound thereof (3), at most 10% by weight of at least one selected from an alkali metal element, an alkaline-earth metal element and a rare-earth element, and an oxide, a hydroxide, a nitride, a boride and a sulfide of said elements in particles, wherein a content of said particles having a particle diameter of at

most 3 μ m is at least 0.3% by weight with respect to the entire alloy.

29. The electrode material for electrical discharge machining according to claim 28, containing said at least one selected from said alkali metal element, said
5 alkaline-earth metal element and said rare-earth element, and said oxide, said hydroxide, said nitride, said boride and said sulfide of said elements in particles, wherein a content of said particles having a particle diameter of at most 3 μ m is at least 0.6% by weight with respect to the entire alloy.

10 30. The electrode material for electrical discharge machining according to claim 28, containing said at least one selected from said alkali metal element, said alkaline-earth metal element and said rare-earth element, and said oxide, said hydroxide, said nitride, said boride and said sulfide of said elements in particles, wherein a content of said particles having a particle diameter of at most 1 μ m is at least 0.3% by weight
15 with respect to the entire alloy.

31. The electrode material for electrical discharge machining according to claim 28, wherein said at least one selected from said alkali metal element, said alkaline-earth metal element and said rare-earth element, and said oxide, said hydroxide, said
20 nitride, said boride and said sulfide of said elements in particles exists in the Cu (2).

32. The electrode material for electrical discharge machining according to claim 28, wherein said at least one selected from said alkali metal element, said alkaline-earth metal element and said rare-earth element, and said oxide, said hydroxide, said
25 nitride, said boride and said sulfide of said elements in particles exists in some of W (1) particles.

33. The electrode material for electrical discharge machining according to

claim 28, wherein said alkali metal element, said alkaline-earth metal element and said rare-earth element, and said oxide, said hydroxide, said nitride, said boride and said sulfide of said elements are at least one of Ba, Nd, Ce, Y, Ca and K, and an oxide and a hydroxide thereof.

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34. The electrode material for electrical discharge machining according to claim 28, wherein said W (1) contains at least 30% by weight of particles having a particle diameter of at most 1 μ m with respect to all of W (1) particles.

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35. The electrode material for electrical discharge machining according to claim 28, wherein at most 10% by weight of Ni is further contained instead of a portion of said Cu (2).

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36. A method of manufacturing the electrode material for electrical discharge machining recited in claim 28, using a source powder containing a Cu powder and/or a W powder, and a powder of at least one selected from an alkali metal element, an alkaline-earth metal element and a rare-earth element, and an oxide, a hydroxide, a nitride, a boride and a sulfide of said elements, said source powder being mixed by using one of a mechanical alloying method, a method of using a fine source powder, and a coprecipitation method.

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37. An electrode material for electrical discharge machining made of a W-Cu alloy containing at least 40% by weight of W (1), at most 15% by weight of one of an additional element and a compound thereof (3), and a balance of Cu (2), containing, as one of said additional element and said compound thereof (3), at most 10% by weight of at least one selected from an alkali metal element, an alkaline-earth metal element and a rare-earth element, and an oxide, a hydroxide, a nitride, a boride and a sulfide of said elements in particles, wherein a content of said particles having an interparticle spacing

of at most 20 μ m is at least 0.3% by weight with respect to the entire alloy.

38. The electrode material for electrical discharge machining according to claim 37, containing said at least one selected from said alkali metal element, said alkaline-earth metal element and said rare-earth element, and said oxide, said hydroxide, said nitride, said boride and said sulfide of said elements in particles, wherein a content of said particles having an interparticle spacing of at most 10 μ m is at least 0.3% by weight with respect to the entire alloy.

39. The electrode material for electrical discharge machining according to claim 37, containing said at least one selected from said alkali metal element, said alkaline-earth metal element and said rare-earth element, and said oxide, said hydroxide, said nitride, said boride and said sulfide of said elements in particles, wherein a content of said particles having an interparticle spacing of at most 10 μ m is at least 0.7% by weight with respect to the entire alloy.

40. The electrode material for electrical discharge machining according to claim 37, wherein said at least one selected from said alkali metal element, said alkaline-earth metal element and said rare-earth element, and said oxide, said hydroxide, said nitride, said boride and said sulfide of said elements in particles exists in the Cu (2).

41. The electrode material for electrical discharge machining according to claim 37, wherein said at least one selected from said alkali metal element, said alkaline-earth metal element and said rare-earth element, and said oxide, said hydroxide, said nitride, said boride and said sulfide of said elements in particles exists in some of W (1) particles.

42. The electrode material for electrical discharge machining according to

claim 37, wherein said alkali metal element, said alkaline-earth metal element and said rare-earth element, and said oxide, said hydroxide, said nitride, said boride and said sulfide of said elements are at least one of Ba, Nd, Ce, Y, Ca and K, and an oxide and a hydroxide thereof.

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43. The electrode material for electrical discharge machining according to claim 37, wherein said W (1) contains at least 30% by weight of particles having a particle diameter of at most 1 μ m with respect to all of W (1) particles.

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44. The electrode material for electrical discharge machining according to claim 37, wherein at most 10% by weight of Ni is further contained instead of a portion of said Cu (2).

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45. A method of manufacturing the electrode material for electrical discharge machining recited in claim 37, using a source powder containing a Cu powder and/or a W powder, and a powder of at least one selected from an alkali metal element, an alkaline-earth metal element and a rare-earth element, and an oxide, a hydroxide, a nitride, a boride and a sulfide of said elements, said source powder being mixed by using one of a mechanical alloying method, a method of using a fine source powder, and a coprecipitation method.

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